DOCUMENT RESUME

ED 072 775 JC 730 045

AUTHOR	Byerly, Richard L.; And Others
TITLE	Evaluation Model for Career Programs. Final Report.
INSTITUTION	Des Moines Area Community Coll., Ankeny, Iowa.
SPONS AGENCY	National Center for Educational Research and Development (DHEW/OE), Washington, D.C. Regional Research Program.
BUREAU NO	BR-1-G-065
PUB DATE	Dec 72
GRANT	OEG-7-71-0022
NOTE	54p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Analysis of Variance; *Community Colleges; *Curriculum Evaluation; Curriculum Planning; Item Analysis; *Models; Performance Criteria; Post Secondary Education; Program Evaluation; Questionnaires; *Surveys; Tables (Data); Technical Reports; Training Objectives; *Vocational Education; Vocational Followup

ABSTRACT

A study was conducted to provide and test an evaluative model that could be utilized in providing curricular evaluation of the various career programs. Two career fields, dental assistant and auto mechanic, were chosen for study. A questionnaire based upon the actual job performance was completed by six groups connected with the auto mechanics and dental assistant programs at the Des Moines Area Community College--students, ex-students, advisory board, employers, potential employers, and instructors. The questionnaires were divided into sets of items based on job performance objectives, and means were determined for each group on each set of items. The means were tested with an analysis of variance procedure. Where significant differences were found, paired "t" tests were used to determine which groups were responding differently. The analysis showed significant differences for: auto mechanics--fuel system, starting system, electrical, suspension and alignment, engine, and power train; dental assistant--x-ray procedures, office procedures, and chairside procedures. The differences found indicated the areas for curricular revisions and objective-by-objective analysis. (Author/KM)

1-G-065

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FINAL REPORT

PROJECT NO. 1G065
GRANT NO. OEG-7-71-0022

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EVALUATION MODEL FOR CAREER PROGRAMS

December, 1972

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Office of Education
National Center for Educational Research and Development
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ABSTRACT

The problem of evaluation of career education programs at community colleges is a problem of considerable concern. The purpose of this study was to provide and test an evaluative model that could be utilized in providing curricular evaluation of the various career programs. For the study two career fields were chosen -- dental assistant and auto mechanics.

Six groups which provide curricular input or are directly involved with the auto mechanics and dental assistant programs at the Des Moines Area Community College were included in the study. They were:

1. Students
2. Ex-students
3. Advisory board
4. Employers
5. Potential employers
6. Instructors

A questionnaire based upon the actual job performance was developed to be completed by the members of each group. These questionnaires were divided into sets of items (based on job performance objectives), and means were determined for each group on each set of items. These means were tested by utilizing an analysis of variance procedure. Where significant differences were found, paried "t" tests were used in an attempt to determine which groups were responding differently.

The analysis for the auto mechanics questionnaire showed significant differences in relation to the following sets of items:

1. Fuel system
2. Starting system
3. Electrical
4. Suspension and alignment
5. Engine
6. Power train

The dental assistant area showed significant differences for:

1. X-ray procedures
2. Office procedures
3. Chairside procedures

The differences that were found indicated the areas for curricular revisions and objective-by-objective analysis. In order to replicate this model for other career programs, carefully defined program objectives are necessary.

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The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Office of Education

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PURPOSE OF THE STUDY

Evaluation of the career programs of the two-year community colleges is a problem of considerable concern. Several factors contribute to the problem. One factor is a lack of research oriented educators who are able to operationalize the evaluative routines necessary. Secondly, but equally important, the rapid growth patterns of these institutions has caused the major emphasis to be placed on the developmental problems of the career programs rather than on the evaluative aspects. Many of these programs have now been in existence a sufficient period of time to justify a systematic evaluation of the programs.

Research in the field has been done but the approach has differed. Vocational research has, in the past, tended to be more empirical in nature. Coster, et al (1), conducted a study in which they analyzed evaluations of career programs and found that a great deal was done by value judgments alone. Knuth (3), surveyed 1,002 graduates with regard to such items as employment status, age, and number of dependents but did not consider employers.

Drost (2), indicated that the task-oriented approach to evaluating career programs was possible. While his study accomplished several goals, it held several short-comings. First of all, it left no provision for a measure which would determine a degree of proficiency. That is, the respondent was measured as polar--either a yes or no, a plus or minus.

The insurgence of the behavioral objective approach afforded flexible dimensions that the task approach did not. Therefore, an approach that fell within educational needs was more desirable, as stated in the Review of Educational Research (4), "Rarely have objectives been stated as measurable products involving a component of time."

Quality educational programs depend on careful analysis and planning. This study

was designed to provide and test a scientific model to be utilized in evaluating all career programs. These evaluations would provide necessary information for curriculum development and/or revision. The provision of a workable model will enable schools that do not have research personnel to evaluate their career programs in such a way that the results could be easily organized, implemented and disseminated to those concerned. Instructors will benefit by being provided feedback as to how businesses view their graduates. Students will have a better idea of what is expected of them by instructors and employers. Employers will have a better opportunity to emphasize what they feel is important. Increased communication between the various groups will benefit the entire program by making each group aware of the desires and problems of the other groups involved.

METHOD OF PROCEDURE

For the purposes of this study, two career occupational training areas of the Des Moines Area Community College were chosen: (1) auto mechanics, and (2) dental assistant. The conceptualization for this evaluative procedure is given by the model in Appendix A.

In order to implement the conceptualization of the design, six groups were established for each of the two training areas selected: (1) presently enrolled students, (2) instructors, (3) advisory board members, (4) former Des Moines Area Community College students on the job, (5) employers of people who have completed the automotive or dental assistant programs at the Des Moines Area Community College, and (6) other potential employers from the eleven-county Des Moines Area Community College area who have not yet hired graduates of the automotive or dental assistant programs, but who may have a need or desire to do so in the future.

Items to be used in the questionnaires for the two programs were determined by the chairmen of the programs involved in conjunction with other members of the instructional staff and experts in the field. Members of the instructional staff participated in a three-day workshop in the fall of 1970 to assist in the development and use of behavioral objectives. An in-service director was also employed to develop behavioral objectives and measurable outcome approaches to career education.

Consideration of response time and other limitations resulted in the development of items that allowed each person in each of the six previously mentioned groups to rate each item according to the following scheme:

0 = Of no importance
1 = Desirable, but not necessary
2 = Desirable and necessary
3 = Absolutely essential

Operationally, the items for the automotive field were divided into thirteen general categorical areas: (1) fuel system, (2) tune-up, (3) starting system, (4) charging system, (5) electrical, (6) air conditioning, (7) drum brakes, (8) disk

brakes, (9) suspension and alignment, (10) vehicle safety inspection, (11) engines, (12) power train, and (13) attitudes and personal characteristics. The items for the dental assistant field were divided into five general categorical areas: (1) x-ray procedures, (2) laboratory procedures, (3) office procedures, (4) chair-side procedures and (5) personal traits.

The questionnaire which was used with employers of students who had completed the automotive program, and with possible future employers of students of the automotive program, also requested information that defined whether or not a particular task was performed in their shop, or if it was sent out to a speciality shop. The frequency that each task was performed, that is; daily, weekly, monthly, yearly or not at all was also requested.

The combined returns of two mailings and follow-up of the questionnaire resulted in the following responses to the dental assistant program: seven (7) advisory board members, twenty-five (25) dentists who have employed dental assistants who have completed the dental assistant program at the Des Moines Area Community College, thirty (30) other dentists in the eleven-county area who may have a need for graduates of the dental assistant program in the future, and twenty-seven (27) graduates of the dental assistant program now on the job. Also included in the sample were: thirty-four (34) students presently enrolled and three (3) instructors. These six groups comprised the total population for the analysis for the dental assistant program.

For the automotive questionnaire the returns were: six (6) advisory board members, fourteen (14) employers of graduates of the automotive program at the Des Moines Area Community College, eleven (11) businesses who may have a need for graduates of the automotive program in the future, fourteen (14) graduates of the automotive program now on the job, twenty-seven (27) presently enrolled students and six (6) instructors. These preceding six groups comprise the total population for the automotive program.

In each of the two training areas, arithmetic means were calculated for each of the six groups for each item of the questionnaires. Results were then reported in tabular form. An arithmetic mean was also calculated for each group for each set of items--fuel system, tune-up etc. An analysis of variance procedure was used to compare the group means for the various sets of items as a whole.

An analysis of variance procedure was then used to test the group means for each division of items. The means that were shown to be significantly different by the analysis of variance procedures were then tested by means of a paired "t" test.

FINDINGS

The primary purpose of this study was to provide and test a systematic evaluation process for career education programs. These evaluations would provide necessary information for curriculum development and/or revision. To accomplish the proposed objectives of the study, information for the automotive area was presented in thirteen sections:

1. Fuel system
2. Tune-up
3. Starting system
4. Charging system
5. Electrical
6. Air conditioning
7. Drum brakes
8. Disc brakes
9. Suspension and alignment
10. Vehicle safety inspection
11. Engines
12. Power train
13. Attitudes and personal characteristics.

Information for the dental assistant program was presented in five sections:

1. X-ray procedures
2. Laboratory procedures
3. Office procedures
4. Chairside procedures
5. Personal traits

Two mailings of the questionnaires resulted in the following returns:

AUTOMOTIVE		DENTAL ASSISTANT	
Advisory Board	6	Advisory Board	7
Employers	14	Employers	25
Other Businesses	11	Other Dentists	30
Ex-Students	14	Ex-Students	27
Students	27	Students	34
Instructors	6	Instructors	3

Following are Tables summarizing the rating and analyses for the various items as determined by the following rating scale:

0 - Of no importance

1 - Desirable but not necessary

2 - Desirable and necessary

3 - Absolutely essential

AUTOMOTIVE

The means for each group for individual items on the automotive questionnaires are presented in Table I:

TABLE I, GROUP MEANS I. FUEL SYSTEM	ADVISORY BOARD	EMPLOYERS	OTHER BUSINESSES	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Test fuel pump by making vacuum, pressure and volume checks.	2.8333	2.2143	2.3636	2.0714	2.4815	2.8333
2. Replace fuel pump with new or rebuilt pump.	1.8333	2.2143	2.6364	1.5714	1.0000	2.8333
3. Replace carburetor with new or rebuilt carburetor.	2.0000	2.1429	2.0909	1.2857	1.0741	2.5000
4. Remove carburetor and rebuild and adjust.	2.5000	2.4286	3.0000	2.7143	2.9259	2.8333
5. Repair or replace gas tank fuel sending unit or dash unit.	2.1667	2.0714	2.4545	1.9286	1.7778	2.8333
6. Replace gas filters and air cleaner elements.	3.0000	2.4286	2.5455	1.5000	1.7778	2.8333
II. TUNE UP						
1. Check compression by using cylinder balance test, cylinder leakage test or a compression tester.	2.9333	2.7143	2.8192	2.6429	2.7778	2.8333
2. Perform a complete ignition system check with a scope or engine analyzer.	2.6667	2.2857	2.9091	2.5000	2.8148	2.1667
3. Perform a complete ignition system check with the use of volt meter, amp meter, dwell meter and ohm meter.	3.0000	2.2857	2.6364	2.5714	2.4444	2.6667
4. Replace points and plugs.	3.0000	2.7143	2.9091	2.2143	2.4074	2.6667
5. Remove distributor and adjust vacuum advance, mechanical advance and dwell.	2.6667	2.0714	2.2727	2.5000	2.7037	2.8333
6. Remove distributor and rebuild.	2.1667	1.5000	2.0000	2.3571	2.5926	2.5000
7. Remove distributor and replace with new or rebuilt unit.	1.8333	2.0000	1.9091	1.3571	1.1481	2.5000
III. STARTING SYSTEM						
1. Check battery by using hydrometer, volts-amps tester or other types of test equipment.	3.0000	2.7143	2.8182	2.7143	2.6667	2.8333
2. Test starting system by checking voltage drops, solenoid pull in and hold in windings, and amperage draw of starting system.	2.8333	2.3571	2.8182	2.5714	2.6667	2.6667
3. Replace or rebuild solenoid.	2.3333	2.0714	2.3636	1.7857	1.6667	2.1667
4. Replace starter motor with new or rebuilt unit.	1.8333	2.2143	2.2727	1.3571	1.0741	2.5000
5. Overhaul starter.	2.1667	1.8571	2.8182	2.5000	2.5926	2.6667

TABLE I (CONTINUED)

TABLE I, GROUP MEANS IV. CHARGING SYSTEM	ADVISORY BOARD	EMPLOYERS	OTHER BUSINESSES	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Check output of charging system with volts-amps tester.	3.0000	2.6429	2.6364	2.5714	2.7778	2.8333
2. Adjust regulator with the use of volts-amps tester.	2.5000	1.6429	2.1818	2.4286	2.4074	2.5000
3. Replace charging system regulator.	2.1667	2.2857	2.2727	2.0000	1.4815	2.5000
4. Replace D C generator with new or rebuilt unit.	1.5000	2.0000	2.2727	1.2857	1.2593	2.5000
5. Overhaul or rebuild D C generator.	1.8333	1.4286	2.2727	2.2857	2.1481	1.5000
6. Replace alternator with new or rebuilt unit.	1.8333	2.3571	2.3636	1.3571	1.1481	2.5000
7. Rebuild alternator.	2.6667	1.7143	2.3636	2.4286	2.7037	2.6667
8. Test diodes with diode tester or test light.	2.8333	2.0714	2.4545	2.5000	2.5926	2.6667
V. ELECTRICAL						
1. Check lighting system and repair by replacing switches, bulbs, relays or wires.	2.8333	2.5714	2.7273	2.4286	2.2593	2.6667
2. Repair turn signal system by replacing bulbs, wires or flasher.	2.8333	2.2857	2.8182	2.1429	2.1481	2.6667
3. Repair or replace turn signal switch or control.	2.3333	2.1429	2.5455	2.2143	2.0741	2.6667
4. Repair or replace electric windshield wiper motors.	2.8333	2.0000	2.5455	2.0000	1.7778	2.5000
5. Repair electrical power units such as power seats or windows.	2.5000	1.3571	2.0000	1.7857	1.6667	1.8333
6. Repair or replace heater motors or controls.	2.5000	2.0000	2.5455	1.9286	1.8148	2.1667
VI. AIR CONDITIONING						
1. Re-charge air conditioner with freon.	3.0000	2.2143	2.5455	2.6429	2.6667	2.3333
2. Replace compressor seals.	2.6667	2.0000	2.3636	2.7143	2.4444	2.0000
3. Replace compressor with new or rebuilt unit.	2.0000	1.8571	2.2727	2.0000	1.7407	2.3333
4. Repair or replace automatic controls for air conditioners.	2.3333	1.5714	2.5455	2.2857	2.0741	1.6667

TABLE I (CONTINUED)

TABLE I, GROUP MEANS VII. DRUM BRAKES	ADVISORY BOARD	EMPLOYERS	OTHER BUSINESSES	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Replace brake shoes and adjust.	2.8333	2.5714	2.8182	2.3571	2.4074	2.6667
2. Recondition wheel cylinders and master cylinder.	2.6667	2.4286	2.8182	2.4286	2.5926	2.6667
3. Replace wheel cylinders or master cylinder with rebuilt or new units.	2.1667	2.428	2.7273	1.6429	1.5926	2.6667
4. Overhaul power brake units.	1.6667	1.3571	2.0000	2.1429	2.1481	1.1667
5. Replace power brake units with rebuilt or new units.	2.5000	2.0000	2.0000	1.7143	1.7778	2.6667
6. Recondition brake drums with drum lathe.	2.5000	1.3571	1.6364	2.3571	2.8148	2.3333
7. Grind brake shoes to fit drums.	2.5000	1.2143	1.4545	2.2857	2.7407	2.3333
VIII. DISK BRAKES						
1. Replace brake pads or pucks.	3.0000	2.5000	2.3636	2.5000	2.4444	2.6667
2. Overhaul caliper assemblies.	2.6667	2.0714	2.1818	2.6429	2.7778	2.6667
3. Replace caliper assemblies with rebuilt or new.	2.6667	2.1729	2.0000	1.7857	1.7778	2.5000
4. Recondition rotor or disk with lathe.	2.1667	1.0714	1.1818	2.4296	2.5926	1.8333
5. Replace rotor or disk.	2.1667	2.3571	2.0000	2.0714	1.6667	2.6667
6. Overhaul power brake units.	2.3333	1.2857	1.8182	2.0714	2.0370	1.3333
7. Replace power brake units with new or rebuilt.	2.1667	1.9286	2.0909	1.7143	1.5556	2.5000
IX. SUSPENSION AND ALIGNMENT						
1. Make tracking check and road height check.	2.3333	1.7857	1.6364	2.2143	2.4444	2.8333
2.Align front end and correct caster, camber and toe in.	2.8333	2.0000	2.2727	2.7143	2.9259	2.8333
3. Overhaul manual steering gear.	2.3333	1.7143	1.8182	2.2857	2.1481	2.3333
4. Overhaul power steering gear or pump.	2.3333	1.5714	2.1818	2.3571	2.0000	1.8333
5. Adjust steering gear.	2.5000	2.2857	2.3636	2.5714	2.5556	2.6667
6. Replace ball joints.	2.5000	1.9286	2.3636	2.3571	2.7407	2.8333
7. Replace king pins.	2.1667	2.0714	2.0909	2.2143	2.1852	2.1667
8. Replace bushings in support arms or A frames.	2.5000	1.9286	1.8182	2.2957	2.5185	2.5000
9. Replace front or rear springs, or torsion bars.	2.5000	1.8571	1.8182	2.3571	2.4444	2.6667
10. Replace shock absorbers.	2.6667	2.1429	2.5455	1.7143	1.8519	2.8333
11. Balance wheels and correct static and dynamic balance.	3.0000	2.2857	2.6364	2.6429	2.8148	2.8333

TABLE I (CONTINUED)

TABLE I, GROUP MEANS X. VEHICLE SAFETY INSPECTION	ADVISORY BOARD	EMPLOYERS	OTHER BUSINESSES	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Make vehicle safety inspection as required by Iowa law.	2.6667	2.0000	2.9091	1.7143	1.9630	2.6667
XI. ENGINES						
1. Remove heads and reface valves and recondition valve seats.	3.0000	2.1429	2.6364	2.5000	2.7407	2.8333
2. Recondition valve guides by knurling or guide replacement.	2.8333	1.7143	2.9090	2.5714	2.7407	2.0000
3. Replace valve seats.	2.5000	0.9286	1.1818	2.1429	2.2593	1.6667
4. Clean and test hydraulic valve lifters.	1.8333	1.4296	2.0909	2.0000	2.3704	2.6667
5. Replace engine with new or rebuilt short block.	2.1667	2.2143	2.3636	1.7143	1.7407	2.8333
6. Overhaul engine assembly.	2.3333	2.3571	2.6364	2.7857	2.7407	2.5000
7. Fit new pistons in block by honing or boring.	2.1667	1.1429	2.1818	2.5714	2.7037	1.6667
8. Fit oversize piston pins.	21.667	0.8571	1.6364	2.5000	2.6296	2.0000
9. Recondition connecting rods.	2.1667	1.0000	0.9091	2.2143	2.2963	1.1667
10. Grind crankshaft.	1.5000	0,5000	0.9091	1.5000	1.1852	0.6667
11. Line-bore main bearing bores.	1.5000	0.2857	0.7273	2.0714	1.5556	0.6667
12. Replace timing chain, gears or camshaft.	2.8333	2.3571	2.6364	2.2143	2.6296	2.6667
13. Replace water pump.	2.8333	2.2143	2.6364	1.7857	1.8148	2.6667
14. Repair or replace emmision control devices such as air pumps, vapor recovery systems, switches or other control units.	2.8333	2.0714	2.5455	1.9286	2.5185	2.8333
XII. POWER TRAIN						
1. Overhaul clutch (manual transmission).	3.0000	2.2857	2.7273	2.1429	2.3704	2.8333
2. Overhaul 3 speed manual transmission.	2.6667	1.7143	2.4545	2.2857	2.4815	2.3333
3. Overhaul 4 speed manual transmission.	2.6667	1.8571	2.3636	2.3571	2.4444	2.3333
4. Overhaul overdrive transmission.	2.0000	0.9286	1.6364	2.0714	2.0370	1.5000
5. Replace universal joints.	3.0000	2.4286	2.7273	2.2143	2.2222	2.8333
6. Overhaul automatic transmission.	2.8333	1.6429	2.4545	2.5714	2.5926	2.6667
7. Remove automatic transmission and replace with rebuilt transmission.	2.8333	1.5000	1.8182	1.6429	1.2963	2.3333
8. Make periodic band and linkage adjustments on automatic transmissions that are recommended by the manufacturers.	2.6667	2.0714	2.4545	2.5714	2.7407	2.8333
9. Overhaul differential assembly.	2.5000	2.0714	2.4545	2.6429	2.6667	2.6667
10. Replace rear axle bearings and seals.	2.6667	2.1429	2.6364	2.2857	2.6667	2.8333

TABLE I (CONTINUED)

TABLE I, GROUP MEANS

XIII. ATTITUDES AND PERSONAL CHARACTERISTICS	ADVISORY BOARD	EMPLOYERS	OTHER BUSINESSES	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Follows policies established regarding attendance, tardiness, promptness and leave time.	2.8333	2.4296	2.8182	2.7857	2.1852	3.0000
2. Habit of working to capacity.	2.8333	2.2857	2.5455	2.6429	2.2963	2.6667
3. Accuracy and thoroughness.	2.6667	2.4296	2.8182	2.7857	2.4815	3.0000
4. Ability to adapt and to change with the job and its requirements.	2.5000	2.1429	2.5455	2.7143	2.6296	3.0000
5. Assumes responsibility.	3.0000	2.2857	2.1818	2.7857	2.4815	2.5000
6. Ability and drive to see the job through to completion.	3.0000	2.2857	2.7273	2.7143	2.5926	2.8333
7. Follows instructions and safety habits.	3.0000	2.4296	2.8182	2.8571	2.4444	3.0000
8. Satisfactory personal appearance, (Grooming, dress, facial expression, mannerisms, neatness, "voice")	2.6667	2.2857	2.3636	2.7143	2.2222	2.5000
9. Ability to get along with others (Supervisors, fellow employees, customers).	2.6667	2.5000	2.4545	2.7143	2.3704	3.0000
10. Ability to write work orders and invoices, figure customers bills and receive payment.	1.8333	1.3571	1.1818	2.2143	1.8519	1.6667

Table II contains the group means for each set of items on the automotive questionnaire. The overall analysis of variance for all groups on all divisions of items indicated that further analysis should be done on each division of items.

TABLE II - GROUP MEANS FOR SETS OF ITEMS

Item	Advisory Board	Employers	Other Businesses	Ex-Students	Students	Instructors
I. Fuel System	2.3889	2.2500	2.5152	1.8452	1.8395	2.6944
II. Tune Up	2.5952	2.2245	2.4935	2.3061	2.4127	2.5952
III. Starting System	2.4333	2.2429	2.6182	2.1857	2.1333	2.5667
IV. Charging System	2.2917	2.0179	2.3523	2.1071	2.0648	2.4583
V. Electrical	2.6389	2.0595	2.5303	2.0833	1.9568	2.4167
VI. Air Conditioning	2.5000	1.9107	2.4318	2.4107	2.2315	2.0833
VII. Drum Brakes	2.3333	1.9082	2.2078	2.1326	2.2963	2.3571
VIII. Disk Brakes	2.4524	1.9082	1.9480	2.1735	2.1217	2.3095
IX. Suspension and Alignment	2.5152	1.9610	2.1405	2.3377	2.4209	2.5758
X. Vehicle Safety Inspection	2.6667	2.0000	2.9091	1.7143	1.9630	2.6667
XI. Engines	2.3333	1.5153	1.9416	2.1786	2.2804	2.0595

TABLE II - GROUP MEANS FOR SETS OF ITEMS (CONTINUED)

Item		Advisory Board	Employers	Other Businesses	Ex-Students	Students	Instructors
XII.	Power Train	2.6833	1.8643	2.3727	2.2786	2.3518	2.5167
XIII.	Attitudes and Personal Characteristics	2.6970	2.2429	2.4455	2.6929	2.3556	2.7167

The analysis of variance results for the various sets of items follow. Wherever a significant difference (by ANOV procedure) was found, the paired "t" tests were utilized in an attempt to determine which groups were responding differently. These results are discussed following each Table where the difference occurred.

TABLE III, ANOV FOR FUEL SYSTEM

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	7.5483	1.5097	5.968**
Within Groups	72	18.2351	0.2533	
Total	77	25.7835		

**Significant at the .01 level

The analysis of variance for the fuel system items was significant at the .01 level. The paired "t" tests indicated that the students and ex-students were responding differently from the other groups in regard to the fuel system items. There was no difference in the responses of the students and ex-students in relation to each other.

TABLE IV, ANOV FOR TUNE UP

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	1.1121	0.2224	1.261
Within Groups	72	12.6970	0.1763	
Total	77	13.8091		

The analysis of variance for the tune up items showed no significant difference between any of the groups.

TABLE V, ANOV FOR STARTING SYSTEM

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	2.6123	0.5225	2.489*
Within Groups	72	15.1128	0.2099	
Total	77	17.7251		

*Significant at the .05 level

The analysis of variance for the starting system items was significant at the .05 level. The paired "t" tests indicated that the students and ex-students were responding differently than the other groups in regard to the starting system items, with no difference between their responses.

TABLE VI, ANOV FOR CHARGING SYSTEM

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	1.6060	0.3212	1.534
Within Groups	72	15.0706	0.2093	
Total	77	16.6765		

The analysis of variance for the charging system items showed no significant difference between any of the groups.

TABLE VII, ANOV FOR ELECTRICAL

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	4.6143	0.9229	2.700*
Within Groups	72	24.6072	0.3418	
Total	77	29.2214		

*Significant at the .05 level

The analysis of variance for the electrical items was significant at the 0.05 level. The paired "t" tests indicated that the employers, students and ex-students were responding differently than the other three groups with regard to the electrical items.

TABLE VIII, ANOV FOR AIR CONDITIONING

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	2.8840	0.5768	1.678
Within Groups	72	24.7378	0.3436	
Total	77	27.6218		

The analysis of variance for the air conditioning items showed no significant difference between any of the six groups.

TABLE IX, ANOV FOR DRUM BRAKES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	1.7568	0.3514	1.163
Within Groups	72	21.7456	0.3020	
Total	77	23.5024		

The analysis of variance for the drum brakes items showed no significant difference between any of the six groups.

TABLE X, ANOV FOR DISK BRAKES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	1.8604	0.3721	1.069
Within Groups	72	25.0437	0.3478	
Total	77	26.9041		

The analysis of variance for the disk brakes items showed no significant difference between any of the six groups.

TABLE XI, ANOV FOR SUSPENSION AND ALIGNMENT

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	3.0356	0.6071	2.572*
Within Groups	72	16.9917	0.2360	
Total	77	20.0273		

*Significant at the .05 level

The analysis of variance for the suspension and alignment items was significant at the 0.05 level. The paired "t" tests indicated that the employers and other businesses were responding differently than the other groups in regard to the suspension and alignment items. There was no difference in the responses of the employers and other businesses.

TABLE XII, ANOV FOR VEHICLE SAFETY INSPECTION

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	13.4373	2.6875	2.499*
Within Groups	72	77.3962	1.0750	
Total	77	90.8335		

*Significant at the 0.05 level

The analysis of variance for the vehicle safety inspection was significant at the 0.05 level. The paired "t" tests indicated that the responses of the other businesses were slightly different than the responses of the students and ex-students.

TABLE XIII, ANOV FOR ENGINES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	6.2634	1.2527	5.640*
Within Groups	72	16.0068	0.2223	
Total	77	22.2703		

*Significant at the 0.01 level

The analysis of variance for the engine items was significant at the 0.01 level. The paired "t" tests indicated that the employers were responding differently than the other groups in regard to the items for engines.

TABLE XIV, ANOV FOR POWER TRAIN

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	3.9531	0.7906	3.670*
Within Groups	72	15.5000	0.2153	
Total	77	19.4531		

*Significant at the 0.01 level

The analysis of variance for the power train items was significant at the 0.01 level. The paired "t" tests indicated that employers were responding differently than the other groups in regard to the power train items.

TABLE XV, ANOV FOR ATTITUDES AND PERSONAL CHARACTERISTICS

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	5	2.4561	0.4912	1.396
Within Groups	72	25.3232	0.3517	
Total	77	27.7793		

The analysis of variance for the attitudes and personal characteristics items showed no significant difference between groups.

An additional aspect to the automotive study was the frequency for the various tasks to be performed. This was essential because of the growing trend to subcontract certain automotive repair functions.

The summary of that frequency analysis is given in Table XVI.

TABLE XVI, FREQUENCY OF THE TASK PERFORMED

TASK	FREQUENCY OF THIS TASK BEING DONE IN YOUR SHOP			
	DAILY	WEEKLY	MONTHLY	YEARLY OR NOT AT ALL
I. FUEL SYSTEM				
1. Test fuel pump by making vacuum, pressure and volume checks	6	14	7	0
2. Replace fuel pump with new or rebuilt pump	4	19	4	0
3. Replace carburetor with new or rebuilt carburetor	2	6	12	6
4. Remove carburetor and rebuild and adjust	8	14	4	0
5. Repair or replace gas tank fuel sending unit or dash unit	3	10	11	2
6. Replace gas filters and air cleaner elements	23	2	2	0
II. TUNE UP				
1. Check compression by using cylinder balance test, cylinder leakage test or a compression tester.	19	7	1	0
2. Perform a complete ignition system check with a scope or engine analyzer	23	2	1	1
3. Perform a complete ignition system check with the use of volt meter, amp meter, dwell meter and ohm meter	17	6	2	1
4. Replace points and plugs	24	3	0	0
5. Remove distributor and adjust vacuum advance, mechanical advance and dwell	10	7	7	1
6. Remove distributor and rebuild	1	5	12	6
7. Remove distributor and replace with new or rebuilt unit	0	4	13	10

TABLE XVI, FREQUENCY OF THE TASK PERFORMED

TASK	FREQUENCY OF THIS TASK BEING DONE IN YOUR SHOP			
	DAILY	WEEKLY	MONTHLY	YEARLY OR NOT AT ALL
III. STARTING SYSTEM				
1. Check battery by using hydrometer, volts-amps tester or other types of test equipment	22	4	1	0
2. Test starting system by checking voltage drops, solenoid pull in and hold in windings, and amperage draw of starting system	12	13	2	0
3. Replace or rebuild solenoid	4	16	3	2
4. Replace starter motor with new or rebuilt unit	4	17	5	1
5. Overhaul starter	4	12	8	0
IV. CHARGING SYSTEM				
1. Check output of charging system with volts-amps tester	16	9	2	0
2. Adjust regulator with the use of volts-amps tester	5	7	6	8
3. Replace charging system regulator	4	14	9	0
4. Replace D C generator with new or rebuilt unit	2	10	12	3
5. Overhaul or rebuild D C generator	2	7	10	3
6. Replace alternator with new or rebuilt unit	1	14	8	4
7. Rebuild alternator	2	14	7	1
8. Test diodes with diode tester or test light	3	12	9	2
V. ELECTRICAL				
1. Check lighting system and repair by replacing switches, bulbs, relays or wires	16	10	1	0

TABLE XVI, FREQUENCY OF THE TASK PERFORMED

TASK	FREQUENCY OF THIS TASK BEING DONE IN YOUR SHOP			
	DAILY	WEEKLY	MONTHLY	YEARLY OR NOT AT ALL
V. ELECTRICAL (continued)				
2. Repair turn signal system by replacing switches, bulbs, wires or flasher	18	8	0	1
3. Repair or replace turn signal switch or control	7	12	7	1
4. Repair or replace electric windshield wiper motors	4	9	10	2
5. Repair electrical power units such as power seats or windows	1	6	11	7
6. Repair or replace heater motors or controls	2	9	12	2
VI. AIR CONDITIONING				
1. Recharge air conditioner with Freon	13	10	3	1
2. Replace compressor seals	8	6	9	3
3. Replace compressor with new or rebuilt unit	5	4	12	6
4. Repair or replace automatic controls for air conditioners	5	3	8	10
VII. DRUM BRAKES				
1. Replace brake shoes and adjust	10	15	2	0
2. Recondition wheel cylinders and master cylinder	8	15	4	0
3. Replace wheel cylinders or master cylinder with rebuilt or new units	6	16	4	1
4. Overhaul power brake units	1	2	14	4
5. Replace power brake units with rebuilt or new units	1	3	12	9

TABLE XVI, FREQUENCY OF THE TASK PERFORMED

TASK	FREQUENCY OF THIS TASK BEING DONE IN YOUR SHOP			
	DAILY	WEEKLY	MONTHLY	YEARLY OR NOT AT ALL
VII. DRUM BRAKES (continued)				
6. Recondition brake drums with drum lathe	4	7	4	2
7. Grind brake shoes to fit drums	3	4	3	5
VIII. DISK BRAKES				
1. Replace brake pads or pucks	7	13	7	0
2. Overhaul caliper assemblies	3	6	13	3
3. Replace caliper assemblies with rebuilt or new	3	4	11	9
4. Recondition rotor or disk with lathe	3	3	5	3
5. Replace rotor or disk	3	6	14	3
6. Overhaul power brake units	1	2	10	8
7. Replace power brake units with new or rebuilt	1	1	12	12
IX. SUSPENSION AND ALIGNMENT				
1. Make tracking check and road height check	6	7	6	4
2. Align front end and correct caster, camber and toe in	14	6	0	2
3. Overhaul manual steering gear	1	4	10	9
4. Overhaul power steering gear or pump	1	6	12	5
5. Adjust steering gear	9	7	8	3
6. Replace ball joints	3	11	10	3
7. Replace king pins	1	5	15	4
8. Replace bushings in support arms or A frames	0	4	15	7

TABLE XVI, FREQUENCY OF THE TASK PERFORMED

TASK	FREQUENCY OF THIS TASK BEING DONE IN YOUR SHOP			
	DAILY	WEEKLY	MONTHLY	YEARLY OR NOT AT ALL
IX. SUSPENSION AND ALIGNMENT (continued)				
9. Replace front or rear springs, or torsion bars	0	4	14	8
10. Replace shock absorbers	10	13	3	1
11. Balance wheels and correct static and dynamic balance	20	5	1	1
X. VEHICLE SAFETY INSPECTION				
1. Make vehicle safety inspection as required by Iowa law	22	0	0	2
XI. ENGINES				
1. Remove heads and reface valves and recondition valve seats	6	14	4	1
2. Recondition valve guides by knurling or guide replacement	6	8	2	2
3. Replace valve seats	2	3	2	5
4. Clean and test hydraulic valve lifters	1	9	9	5
5. Replace engine with new or rebuilt short block	2	6	15	3
6. Overhaul engine assembly	3	7	13	3
7. Fit new pistons in block by honing or boring	4	2	7	5
8. Fit oversize piston pins	3	2	3	3
9. Recondition connecting rods	2	2	2	2
10. Grind crankshaft	2	0	1	2
11. Line-bore main bearing bores	1	1	1	3
12. Replace timing chain, gears or camshaft	5	3	17	1

TABLE XVI, FREQUENCY OF THE TASK PERFORMED

TASK	FREQUENCY OF THIS TASK BEING DONE IN YOUR SHOP			
	DAILY	WEEKLY	MONTHLY	YEARLY OR NOT AT ALL
XI. ENGINES (continued)				
13. Replace water pump	8	12	5	0
14. Repair or replace emission control devices such as air pumps, vapor recovery systems, switches, or other control units	9	7	5	5
XII. POWER TRAIN				
1. Overhaul clutch (manual transmission	3	13	10	1
2. Overhaul three speed manual transmission	1	3	16	4
3. Overhaul four speed manual transmission	1	6	13	6
4. Overhaul overdrive transmission	1	1	3	18
5. Replace universal joints	7	14	6	0
6. Overhaul automatic transmission	3	8	9	5
7. Remove automatic transmission and replace with rebuilt transmission	1	2	9	12
8. Make periodic band and linkage adjustments on automatic transmissions that are recommended by the manufacturers	5	10	7	4
9. Overhaul differential assembly	3	5	11	6
10. Replace rear axle bearings and seals	5	14	7	1

DENTAL ASSISTANT

The means for each group for individual items on the dental assistant questionnaires are presented in Table XVII.

TABLE XVII, GROUP MEANS

I. X-RAY PROCEDURES	ADVISORY BOARD	EMPLOYERS	OTHER DENTISTS	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Position patient and select film size appropriate for patient and technique.	2.8571	2.6000	2.6667	2.4815	2.7941	3.0000
2. Adjust K.V. and M.A. and timer of X-ray machine.	2.4286	2.4400	2.3000	2.0370	2.4706	2.6667
3. Apply bite-wing exposure technique.	2.8571	2.3200	2.7667	2.5926	2.7647	2.6667
4. Apply bisecting and/or paralleling technique for peri-apical exposures.	2.8571	2.3200	2.6333	2.4444	2.7059	2.6667
5. Process and finish exposed films.	3.0000	3.0000	2.9667	2.7407	2.9118	3.0000
6. Evaluate radiographs for diagnostic quality.	2.1429	1.8000	2.0667	1.3704	1.7941	2.6667
7. Mount, label and file radiographs.	3.0000	2.9200	2.8667	2.7778	2.8529	3.0000
8. Practice patient and operatory safety measures for X-radiation.	3.0000	2.9200	2.8333	2.6296	2.8235	3.0000
9. Maintain film storage, change X-ray solutions and clean processing equipment.	2.8571	2.9200	2.9333	2.7037	2.7353	3.0000
II. LABORATORY PROCEDURES						
1. Clean and maintain laboratory instruments and equipment.	2.7143	2.4800	2.8000	2.5556	2.8235	2.6667
2. Store and inventory lab supplies.	2.7143	2.4000	2.7667	2.3704	2.4706	2.6667
3. Pour impressions to produce master casts and dies and articulate casts.	2.5714	2.3200	2.3000	2.3704	2.5588	1.6667
4. Fabricate custom trays, base plates, and occlusal rims for prosthetics.	2.4286	2.1200	2.2667	1.8519	1.7353	2.0000
5. Sprue, invest, and burn out for casting gold procedures.	1.2857	1.2800	1.4667	1.2593	1.5000	1.0000
6. Finish and polish gold alloy castings.	1.2857	1.0800	1.3000	1.2222	1.7059	1.0000
7. Complete simple denture repairs.	1.5714	1.3600	1.6667	1.1781	1.2353	2.0000
8. Fabricate simple temporary acrylic resin appliances.	1.5714	1.2800	1.4667	1.2593	1.4706	1.6667

TABLE XVII (CONTINUED)

TABLE XVII, GROUP MEANS III. OFFICE PROCEDURES	ADVISORY BOARD	EMPLOYERS	OTHER DENTISTS	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Receive and dismiss patients and visitors.	2.7143	2.9200	2.8667	2.6667	2.8235	3.0000
2. Receive and place telephone calls.	2.7143	2.9200	2.8667	2.7778	2.7941	3.0000
3. Prepare correspondence.	2.2857	2.6400	2.7000	2.4074	2.6176	3.0000
4. Perform housekeeping duties.	2.7143	2.9200	2.8333	2.2963	2.5294	3.0000
5. Sort incoming mail.	2.2857	2.6000	2.4667	2.1481	2.2353	2.3333
6. Maintain accurate dental records.	3.0000	2.9600	2.8667	2.7778	2.9706	3.0000
7. Assemble records of patients for treatment.	3.0000	2.9200	2.9000	2.6296	2.8824	3.0000
8. File business and patient records.	2.7143	2.8400	2.9000	2.5185	2.7647	3.0000
9. Establish financial arrangements for services to be rendered.	2.1429	2.0800	2.1000	2.1852	2.5294	2.3333
10. Maintain financial billing and collection records for the office.	2.4286	2.6800	2.6333	2.4815	2.9118	3.0000
11. Maintain appointment control.	2.5714	2.9200	2.8333	2.6296	2.7941	3.0000
12. Maintain an active recall system.	2.5714	2.7200	2.7333	2.4444	2.6176	2.6667
13. Maintain petty cash accounts.	2.4386	2.5200	2.5333	2.1111	2.5882	2.6667
14. Order supplies and verify invoices.	2.5714	2.5600	2.6333	2.4444	2.6176	2.6667
15. Maintain and rotate inventory.	2.5714	2.4800	2.7333	2.3704	2.3824	2.6667
16. Write checks, prepare bank deposits and reconcile bank statements for the office.	1.7143	2.0800	2.1000	2.0370	2.7647	3.0000
17. Complete dental insurance forms.	2.1429	2.6000	2.3333	2.0741	2.7353	3.0000
18. Maintain state and federal information.	1.1429	1.8800	2.0667	1.8519	2.4706	2.3333
19. Prepare tax forms.	1.0000	1.1200	1.1667	1.3333	2.2647	1.6667

TABLE XVII (CONTINUED)

TABLE XVII, GROUP MEANS IV. CHAIRSIDE PROCEDURES (1)	ADVISORY BOARD	EMPLOYERS	OTHER DENTISTS	EX STUDENTS	STUDENTS	INSTRUCTORS
1. Seat and dismiss patients from chair.	3.0000	2.8800	2.9333	2.8148	2.8235	3.0000
2. Identify and care for various dental instruments and equipment.	3.0000	3.0000	2.9333	2.8148	2.9118	3.0000
3. Deliver and receive instruments at chairside in any procedure.	2.5714	2.6400	2.9000	3.0000	2.9412	2.6667
4. Apply Topical anesthetic.	2.1429	1.6000	2.0333	2.0000	1.8824	1.6667
5. Prepare a set-up and assist in the administration of local antiseptic.	2.5714	2.3200	2.7333	2.7037	2.7353	2.6667
6. Prepare instruments and disinfect or sterilize, utilizing cold solution, steam or dry heat method.	2.5714	2.8000	2.9333	2.9630	2.9118	3.0000
7. Maintain chain of antisepsis.	2.5614	2.8800	2.9333	2.8148	2.9118	3.0000
8. Prepare dental materials for placement.	2.5714	2.8000	2.9333	2.9259	2.9118	3.0000
9. Prepare a set-up and assist with amalgam restoration.	2.5714	2.7600	2.8333	2.9630	2.9706	3.0000
10. Evacuate during amalgam procedure.	2.5714	2.6400	2.6333	2.7037	2.9118	2.6667
11. Place matrix for amalgam procedure.	1.7143	1.0800	1.4333	1.4074	2.1176	1.6667
12. Triturate amalgam alloy.	2.4386	2.6400	2.5667	2.6667	2.7353	3.0000
13. Load carrier and place amalgam in cavity preparation.	1.8571	2.0800	2.3667	1.9259	2.4706	2.6667
14. Condense amalgam.	1.5714	0.8000	1.1333	1.1852	1.9706	1.6667
15. Carve amalgam.	1.6514	0.8000	1.0000	1.0741	1.7941	1.6667
16. Prepare a set-up and assist in prophylaxis.	2.4286	2.4800	2.7000	2.8889	2.9706	3.0000
17. Prepare a set-up and assist and aspirate during oral surgery procedure.	2.4286	2.6000	2.7667	2.8889	2.9118	3.0000
18. Cut suture material after tying by doctor.	2.4286	2.3200	2.4333	2.4815	2.5294	2.6667
19. Record oral condition as directed by dentist.	3.0000	2.8000	2.8000	2.9259	2.5059	3.0000
20. Explain post operative procedures to patient.	2.8571	2.3200	2.5667	2.5556	2.2647	2.6667
21. Prepare composite materials for placement.	3.0000	2.8800	2.8667	2.7407	2.6765	2.6667
22. Prepare reversible and irreversible impression material and fill tray for the dentist.	3.0000	2.7600	2.7667	2.7037	2.7353	2.6667
23. Prepare rubber base impression material and fill tray for the dentist.	3.0000	2.6800	2.5000	2.7778	2.7353	2.6667
24. Hold impression in patients' mouth after dentist places impression tray and remove when finished.	2.8571	2.1600	2.3667	2.1852	2.1176	2.0000

TABLE XVII (CONTINUED)

TABLE XVII, GROUP MEANS IV. CHAIRSIDE PROCEDURES (2)	ADVISORY BOARD	EMPLOYERS	OTHER DENTISTS	EX STUDENTS	STUDENTS	INSTRUCTORS
25. Take impression for study model.	2.8571	1.9600	2.2333	2.4074	2.2941	2.3333
26. Prepare a set-up and assist in topical flouride treatment.	2.8571	2.4800	2.6667	2.7778	2.5882	2.6667
27. Apply topical flouride.	2.7143	1.9600	2.0667	2.3333	2.1471	2.6667
28. Instruct patient in oral hygiene.	3.0000	2.5600	2.4333	2.8148	2.8235	3.0000
29. Dispense medication when ordered by dentist.	2.4286	1.6000	2.4333	2.4074	2.2941	2.3333
30. Assist in first aid procedures.	3.0000	2.7200	2.7000	2.7778	2.6471	2.6667
31. Apply coagulants or administer hemo-static.	1.7143	1.3200	1.8000	1.8148	1.7941	1.0000
32. Prepare a set-up and assist in Endodontics.	3.0000	2.7200	2.7333	2.9259	2.7647	2.6667
33. Preserve and incubate bacterial cultures.	1.2857	1.0800	1.5333	1.4815	1.4118	0.6667
34. Prepare a set-up and assist in prosthetic appointments.	3.0000	2.4800	2.6333	2.6667	2.5882	2.3333
35. Prepare a set-up and assist in orthodontic appointments.	2.2857	2.2000	2.1333	2.5926	2.6471	2.3333
36. Prepare a set-up and assist in gold foil appointment.	2.0000	2.0800	1.5000	2.3333	2.3529	2.0000
37. Assist with rubber dam application and removal.	2.4386	2.4800	1.9667	2.5926	2.6765	3.0000
38. Prepare a set-up and assist in peridontal procedures.	2.5714	2.4800	2.5667	2.6296	2.7941	2.3333
39. Examine and sharper instruments as needed.	2.2857	2.0400	2.2667	2.2593	2.5000	2.6667
40. Prepare non-carpule hypodermic syringe for injection of medication.	1.5714	1.5600	1.4333	2.2222	2.6471	2.0000
41. Change engine belt on low speed engine.	1.7143	2.0000	2.0000	2.3704	2.5588	3.0000
42. Place or remove temporary cements.	2.2857	1.6800	1.7667	1.8519	2.1176	2.6667
43. Place or remove periodontal surgical pack.	2.0000	1.3600	1.5000	1.5185	1.8235	2.0000
44. Remove medications (dry socket).	2.0000	1.1200	1.5000	1.4815	1.7647	2.3333
45. Receive from dentist and preserve biopsy specimens.	2.5714	2.0800	2.0000	1.6667	1.7059	1.3333
46. Prepare set-up and assist in operative crown and bridge procedures.	2.8571	2.6800	2.7333	2.7407	2.8529	3.0000

TABLE XVII (CONTINUED)

TABLE XVII, GROUP MEANS V. PERSONAL TRAITS	ADVISORY BOARD	EMPLOYERS	OTHER DENTISTS	EX STUDENTS	STUDENTS	INSTRUCTORS
1. The dental assistant exhibits personal appearance and hygiene appropriate for the appearance.	2.8571	2.9200	2.9333	2.8889	2.9412	3.0000
2. The dental assistant displays punctuality and a concern for regular attendance.	3.0000	2.9600	2.8333	2.8889	2.9706	3.0000
3. The dental assistant is adaptable and establishes good assistant-patient-doctor relationships.	3.0000	2.9600	2.8667	2.7778	2.9412	2.6667
4. The dental assistant seeks and accepts assistance when necessary.	3.0000	2.7200	2.8333	2.7407	2.9118	2.6667
5. The dental assistant displays initiative in learning new duties and meeting changed conditions.	2.8571	2.8000	2.8000	2.8519	2.8529	3.0000
6. At chairside the dental assistant observes and anticipates dentist and patient needs.	3.0000	2.8800	2.8333	2.9630	3.0000	2.6667

Table XVIII contains the group means for each set of items on the dental assistant questionnaire.

TABLE XVIII DENTAL - GROUP MEANS FOR SETS OF ITEMS

Item	Advisory Board	Dentist	Other Dentists	Ex-Students	Students	Instructors
I. X-ray Procedures	2.7778	2.582217	2.6704	2.4197	2.6505	2.8518
II. Lab Procedures	2.0179	1.7900	2.0042	1.7546	1.9375	1.8333
III. Office Procedures	2.3534	2.5453	2.5403	2.3255	2.64705	2.7544
IV. Chairside Procedures	2.4503	2.2035	2.3188	2.4082	2.4878	2.4710
V. Personal Traits	2.9524	2.8733	2.8500	2.8519	2.9363	2.8333

Taking into consideration the fact that there were only three instructors to respond to the dental assistant questionnaire and that such a small group does not lend itself to group analysis, only the other five groups were used in the analysis of variance procedures for the dental assistant questionnaire.

The overall analysis of variance for the five groups on all divisions of items indicated that further analysis should be done on each set of items.

The analysis of variance results for the various sets of items follow. Wherever a significant difference (by ANOV procedure)was found, the paired "t" tests were utilized in an attempt to determine which groups were responding differently. Those results are discussed following each table where the difference occurred.

TABLE XIX, ANOV FOR X-RAY PROCEDURES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	4	1.3401	0.3350	2.476*
Within Groups	118	15.9680	0.1353	
Total	122	17.3081		

*Significant at the .05 level

The analysis of variance for the x-ray procedures items was significant at the 0.05 level. The paired "t" tests indicated that the ex-students were responding differently than the other groups in regard to the x-ray procedures.

TABLE XX, ANOV FOR LABORATORY PROCEDURES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	4	1.3262	0.3315	1.399
Within Groups	118	27.9495	0.2369	
Total	122	29.2756		

The analysis of variance for the laboratory procedures items showed no significant difference between any of the five groups.

TABLE XXI, ANOV FOR OFFICE PROCEDURES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	4	1.7861	0.4465	2.897*
Within Groups	118	18.1868	0.1541	
Total	122	19.9729		

*Significant at the .05 level

The analysis of variance for the office procedures items was significant at the 0.05 level. The paired "t" tests indicated that the advisory board members and the ex-students responded differently than the other groups to the office procedures items. There was no difference in the responses of the advisory board members and the ex-students.

TABLE XXII, ANOV FOR CHAIRSIDE PROCEDURES

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	4	1.3284	0.3321	2.576*
Within Groups	118	15.2144	0.1289	
Total	122	16.5427		

*Significant at the .05 level

The analysis of variance for the chairside procedures was significant at the 0.05 level. The paired "t" tests indicated that the dentists responded differently than the other groups in regard to the chairside procedures items.

TABLE XXIII, ANOV FOR PERSONAL TRAITS

SOURCE OF VARIATION	DF	SS	MS	F
Between Groups	4	0.1907	0.0477	.882
Within Groups	118	6.3752	0.0540	
Total	122	6.5659		

The analysis of variance for the personal traits items showed no significant difference between any of the five groups.

SUMMARY

The purpose of this study was to provide and test an evaluative process to be used in evaluating community college career education programs. This evaluative system will be usable in investigating the curriculum of the various programs for possible revisions. A workable model, capable of replication, will also enable schools that do not have research personnel to evaluate their career programs in such a way that the results could be easily organized, implemented, and disseminated to those with that particular need.

The objectives of this study were fulfilled by developing a questionnaire that was administered to six groups for each of the two career training areas -- dental assistant and auto mechanics. The six groups included:

(1) Students

(2) Instructors

(3) Advisory board

(4) Graduates of the automotive or dental assistant programs at the Des Moines Area Community College now on-the-job.

(5) Employers of people who have completed the auto mechanics or dental assistant programs at the Des Moines Area Community College

(6) People in the eleven county area (the Des Moines Area Community College district) who have not yet hired graduates of the auto mechanics or dental assistant programs but who may have a need or desire to do so in the future.

The questionnaire utilized a four-point rating scale:

0 -- Of no importance

1 -- Desirable but not necessary

2 -- Desirable and necessary

3 -- Absolutely essential

The items for the automotive questionnaire were divided into thirteen areas:

(1) Fuel system

(2) Tune up

(3) Starting system

(4) Charging system

(5) Electrical

(6) Air conditioning

(7) Drum brakes

(8) Disk brakes

(9) Suspension and alignment

(10) Vehicle safety inspection

(11) Engines

(12) Power train

(13) Attitudes and personal characteristics

The items for the dental assistant field were divided into five areas:

(1) X-ray procedures

(2) Laboratory procedures

(3) Office procedures

(4) Chairside procedures

(5) Personal traits

Two mailings of the automotive questionnaire resulted in returns from six advisory board members, fourteen employers of graduates of the automotive program, eleven businesses who may have a need for graduates of the automotive program in the future, fourteen graduates of the automotive program now on-the-job, twenty-seven students presently enrolled, and six instructors. The questionnaire sent to employers also requested information as to whether a particular task was performed in the various shops, or if they were sent out to speciality shops. The frequency that

each task was performed, i.e., daily, weekly, monthly, yearly or not at all, was also requested.

Two mailings of the dental assistant questionnaire resulted in returns for seven advisory board members, twenty-five dentists who have employed dental assistants from the Des Moines Area Community College, thirty dentists who may have a need for graduates of the dental assistant program in the future, twenty-seven graduates of the dental assistant program now on-the-job, thirty-four students, and three instructors.

The analysis of variance for all sets of items on the automotive questionnaire indicated that additional analysis should be done on individual sets of items.

The analysis of variance procedure for the fuel system items was significant at the 0.01 level. The paired "t" tests indicated that the students and ex-students were placing less emphasis on these items than the other four groups.

The analysis of variance on the tune up items showed no significant difference between groups.

The analysis of variance on the starting system items was significant at the 0.05 level. The paired "t" tests indicated the students and ex-students were placing slightly less emphasis on these items than the other four groups were.

The analysis of variance on the electrical items was significant at the 0.05 level. The paired "t" tests indicated that the employers, students and ex-students were placing less emphasis on these items than the other three groups were.

The analysis of variance for the suspension and alignment items was significant at the 0.05 level. The paired "t" tests indicated that the employers and other businesses were placing slightly less emphasis on these items.

The analysis of variance for the vehicle safety inspection items was significant at the 0.05 level. The paired "t" tests indicated that the other businesses felt the vehicle safety inspection was more important than the students and ex-

students did.

The analysis of variance for the engines items was significant at the 0.01 level. The paired "t" tests indicated that the employers were placing less emphasis on these items than the other groups were.

The analysis of variance for the power train items was significant at the 0.01 level. The paired "t" tests indicated that the employers were placing less emphasis on these items than the other groups were.

The analysis of variance for each of the other sets of items, tune up, charging system, air conditioning, drum brakes, disk brakes, and attitudes and personal characteristics, showed no significant difference between groups.

DENTAL ASSISTANT

The analysis of variance for all sets of items on the dental assistant questionnaire indicated that additional analysis should be done on individual sets of items.

The analysis of variance for the x-ray procedures was significant at the 0.05 level. The paired "t" tests indicated that the ex-students were placing less emphasis on these items than the other groups were.

The analysis of variance for the office procedures was significant at the 0.05 level. The paired "t" tests indicated that the advisory board members and the ex-students were placing less emphasis on these items than the other groups were.

The analysis of variance for the chairside procedures items was significant at the 0.05 level. The paired "t" tests indicated that the dentists were placing less emphasis on these items than the other groups were.

The analysis of variance for each of the other sets of items, laboratory procedures and personal traits, showed no significant difference between groups.

AUTOMOTIVE

Implications

Much of the system of group selection used by this research study is not really unique to only one community college or vocational school setting. In fact, this advisory council, student, teacher, and employer approach reflects the method by which many community colleges attempt to obtain curricular feedback. The rationale is simple. The instructor group has practical experience in the particular instructional area prior to his being hired as an instructor.

The advisory group, comprised of active members from that vocation or profession, are responsible for giving feedback that can define or delineate new or changing trends. This advisory committee group should reflect the views of the employer group under consideration. The former students on-the-job reflect many of the concerns and views of present students and instructors.

Using this approach, there were several areas where significant differences did exist between groups. These differences illustrate that the six groups perceive the tasks at different stratas of importance. The implication, therefore, is that curricular revision may be necessary in these areas where divergence was apparent. If revision is not necessary, at least closer examination of the curricular differences could be accomplished.

The areas where differences did exist were as follows:

1. Fuel system - Students and ex-students have different perceptions of the objectives than do the other four groups. The differences in objectives were carried by both in-program and graduate student members. This would indicate that careful analysis of this area should be undertaken. Both student groups did not perceive these to be as important as the remainder of the groups.
2. Starting systems - Again students and ex-students regarded the importance of these objectives differently than did the remainder of the groups.

Careful analysis of the curricular area should be undertaken. Both student groups did not perceive this task to be as important as the other groups.

3. Electrical items - Employers, students and ex-students saw this curricular area as being less important than did the other three groups. Therefore, the advisory committee, representing those businesses and employers, should analyze their positions carefully in this curricular area.
4. Suspension and alignment items - Employers and other businesses perceived these objectives as being less important than did the staff, student groups or advisory committee. The staff should carefully view these areas since they hold much higher curricular views of this area.
5. Engine items - Only the employer group differed on this category. This response is more difficult to interpret than many of the others because the comparable groups - advisory committee and the other potential employers - did not perceive these objectives differently. Careful analysis by the advisory committee and staff should be undertaken in this curricular area. Item-by-item analysis might prove illuminating.
6. Power train items - As in Area #5, only the employers differed significantly on the perception of the importance of these objectives. Comparable action, as in Area #5, is suggested.
7. Tune up - No difference.
8. Charging system - No difference.
9. Air conditioning - No difference.
10. Drum brakes - No difference.
11. Disk brakes - No difference.
12. Attitudes and personal characteristics - No difference.

While several areas of curricular concern did have significant differences, there were many areas in which no differences existed.

What the areas of difference may suggest are:

1. A reordering of curricular or topical items.
2. A greater or lesser emphasis on that topical unit in the time dimension in that course.
3. A restructuring of curricular units and priorities for units.
4. A need for more meetings of instructors and for employer groups to discuss differences.
5. A need for expansion and/or replacement of membership of the present advisory council.
6. In areas where differences exist, item-by-item objective analysis should be conducted.
7. Student/instructor feedback should be carefully calculated to assure maximum communication as to good orientation.
8. In areas of differences, a more extensive behavioral objective approach should be employed.

DENTAL ASSISTANT

Implications

The sets or areas of objectives where no significant differences were exhibited were as follows:

1. Laboratory procedures
2. Personal traits

This does not mean that these areas should not be reviewed but does indicate that a strong convergence of opinion was present. However, significant differences were present in the other areas. The areas where differences did exist were as follows:

1. X-ray procedures - Ex-students placed less emphasis on these items than the other groups. This could indicate that they were not using these

skills as much as they perceived they would. It also may indicate that more emphasis was placed on the instructional program that they felt was important now that they were on-the-job.

2. Office procedures - Advisory board members and ex-students perceived these tasks or objectives as being less important than the other groups. This divergence should be carefully analyzed, possibly by an objective-by-objective analysis of that area. The advisory board and the dentist group should carefully analyze this area to find those points of divergence.
3. Chairside procedures - The dentist group placed less emphasis or perceived these tasks as being less important than the other groups. Special attention should be given to these objectives to see if the differences reflect new procedural practices or new techniques. Item-by-item analysis of the objectives of this topical area should reveal areas where the dentists' group is divergent. Comparison could best be accomplished by using the advisory group and the (outside) dentist group.

The replication of this approach necessitates that clearly defined objectives be established for the curricular areas to be examined.

Essential, also, is a linkage of close communication between the groups involved both in the development of the objectives, the questionnaire instrument, and implementation procedures.

The procedure utilized in this model is not a difficult process. It does, moreover, give a definitive set of procedures and groups to be included in each process and provides a model easily replicated in different settings.

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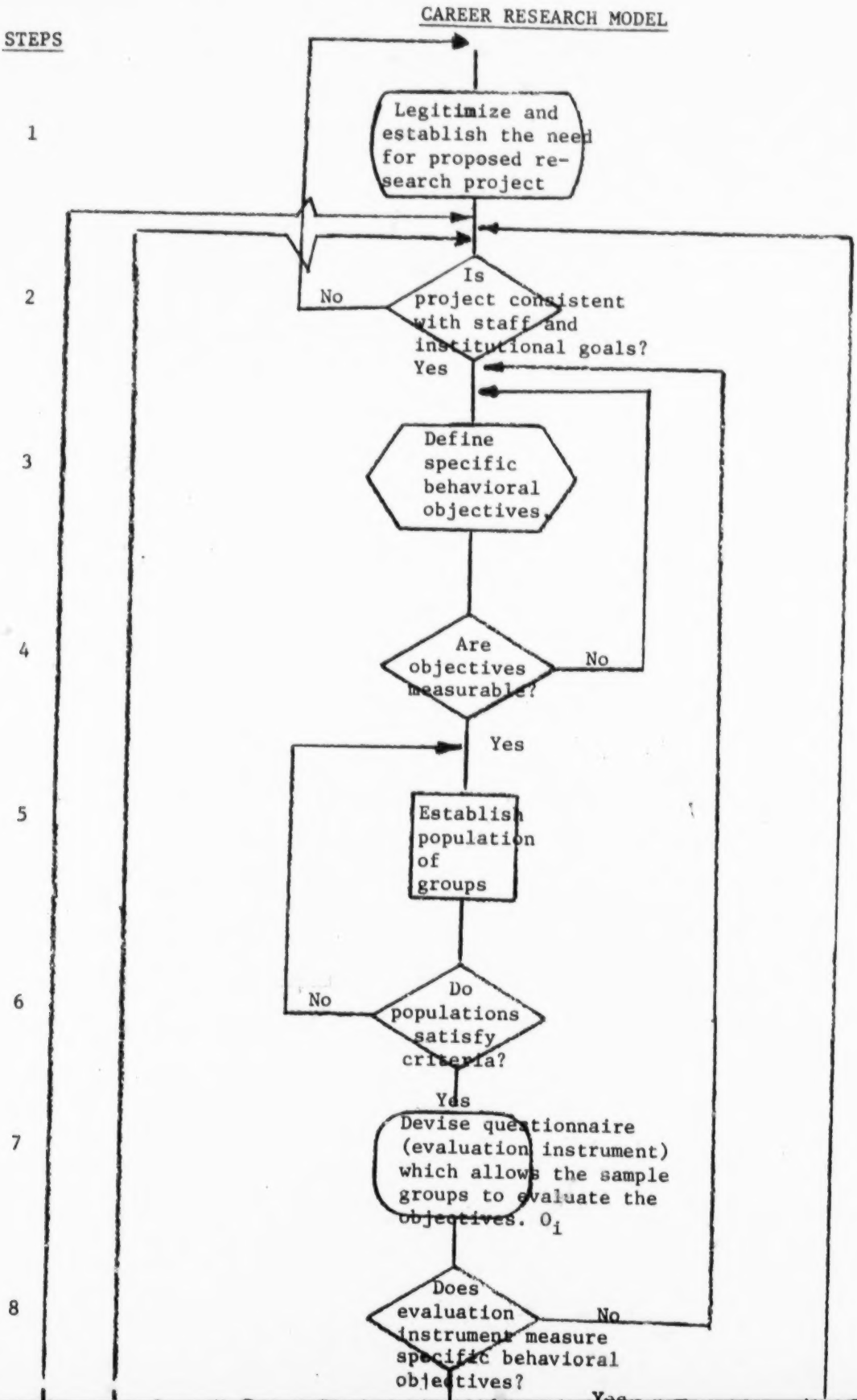
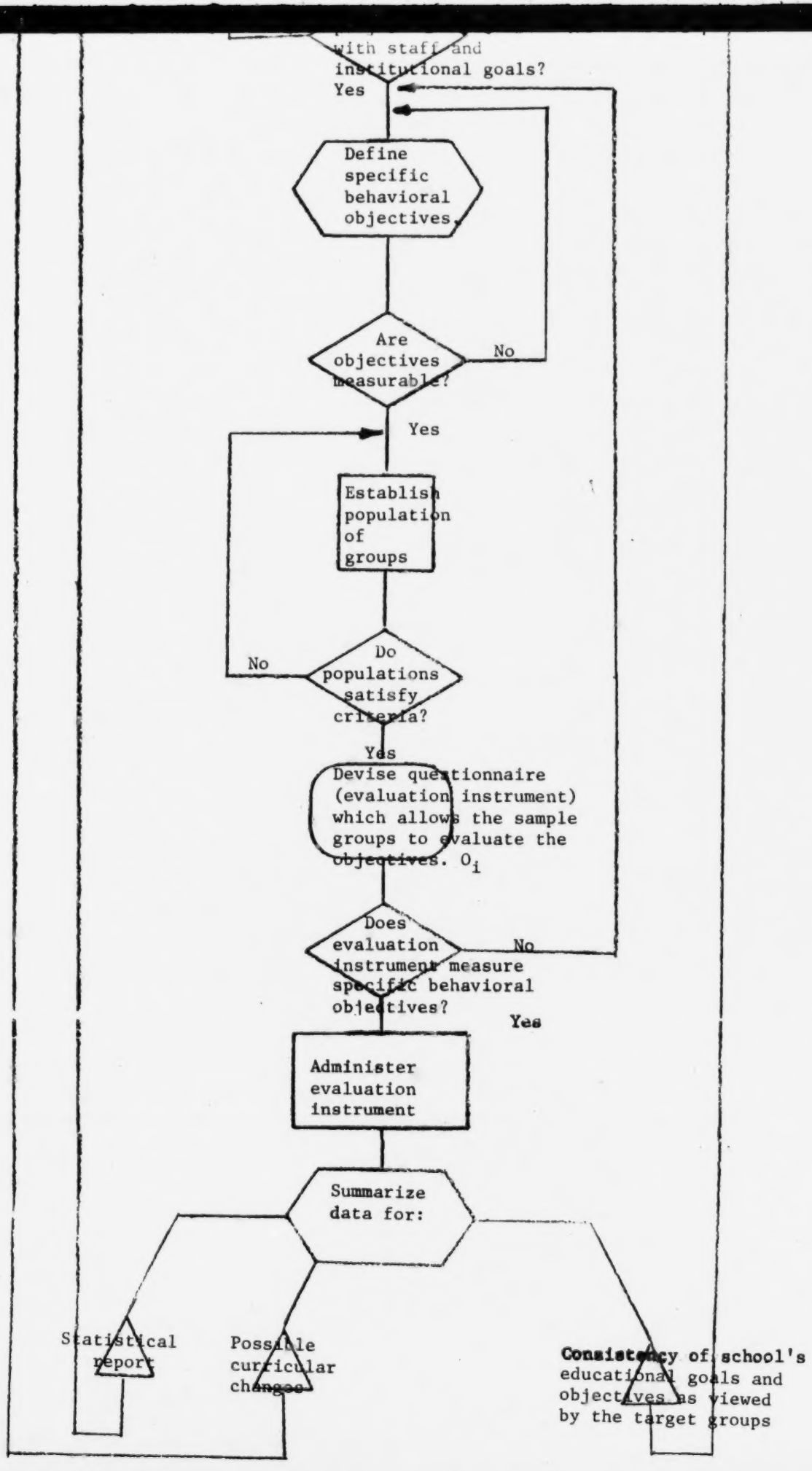
APPENDIX A

CAREER RESEARCH MODEL




with staff and
institutional goals?
Yes
3
Define
specific
behavioral
objectives.
4
Are
objectives
measurable?
No
Yes
5
Establish
population
of
groups
6
No
Do
populations
satisfy
criteria?
Yes
7
Devise questionnaire
(evaluation instrument)
which allows the sample
groups to evaluate the
objectives. O_i
8
Does
evaluation
instrument measure
specific behavioral
objectives?
No
Yes
9
Administer
evaluation
instrument
10
Summarize
data for:
11
Statistical
report
Possible
curricular
changes
Consistency of school's
educational goals and
objectives as viewed
by the target groups